The data items summarized in the tables largely contain raw data measurements that are not scaled by company indexing processes. This removes a degree of procedural variation among companies. For example, companies file a fairly extensive amount of raw data about switching outages, including outage durations and number of lines affected.

The data summarized in this section contain sums, or weighted averages, of data reported by states or study areas and may be useful in assessing overall trends. Where information is reported in terms of percentages or average time intervals, data presented here are based on a composite of individual study area data that are calculated by weighting the percentage or time interval figures. For example, we weight the percent of commitments met by the corresponding number of orders provided in the filed data.[9]

The items contained in the tables are summarized below. Installation, maintenance and customer complaint data are shown in Table 9.1, and switch downtime and trunk servicing data are shown in Table 9.2. Installation and maintenance data are presented separately for services provided to end users and for interexchange carrier access facilities. Outage data categorized by cause are shown in Table 9.3. Customer perception data are contained in Table 9.4 and the associated survey sample sizes are contained in Table 9.5.

This section has attempted to display data elements that have remained roughly comparable over the past few years. More detailed information on the raw data from which this section has been developed is contained on the Commission's website for the ARMIS database

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Division]; and in March 1993, Sprint Corporation acquired Centel Corporation. Although Bell Atlantic and NYNEX merged in August 1997, the tables continue to reflect the merged entities separately. Similarly, SBC, Pacific Telesis and Ameritech facilities are shown separately despite the merger of the SBC and Pacific in April 1997 and SBC and Ameritech in October 1999. Bell Atlantic's recent with GTE and its new name Verizon Communications is not reflected in this report, which reflects carrier status as of the end of 1999.

9 Company composite data were typically recalculated on a consistent basis from study area data, as a number of company supplied composites could not be confirmed. Although the companies have prepared their own company rollups, we have discovered various inconsistencies or inaccuracies in some of these company-prepared composites. We have therefore weighted data involving percentages or time intervals in order to arrive at the more consistent composite data shown in the tables and expect that the companies will want to review their procedures for preparing composites. Parameters used for weighting in this section were appropriate for the composite being calculated and were based on the raw data filed by the carriers but are not necessarily shown in the tables. For example, we calculate composite installation interval data by summing the individual study area results multiplied by the number of installation orders reported for each study area and then dividing the result by the total number of orders.

noted above. In addition, complete data descriptions are available in the Commission Orders referenced above.[10] The row numbers and columns associated with the raw source data in the ARMIS 43-05 report are included in the descriptions below.[11]

1. Percent of Installation Commitments Met

   Percent of installations that were met by the date promised by the company to the customer. It is presented separately for residential and business customers' local service (row 132, columns f and i or af and ai, respectively) and access services provided to carriers (row 112, columns a and c or aa and ac).

2. Average Installation Interval (in days)

   Average interval (in days) between the installation service order and completion of installation. It is shown separately for access services provided to carriers (row 114, column a and c or aa and ac) and for residential and business customers' local service (row 134, columns f and i or af and ai, respectively). Data on intervals for missed installations (rows 113 and 133) were replaced by average interval described above.

3. Average Repair Interval

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10 *See* footnote 6, *supra.*

11 For rows 110-121 in the raw machine readable data sets, column a or aa is the first column; for rows 130 to 151, column d or ad is the first column; for rows 180 to 190, column k or ak is the first column; for rows 200 to 214, column n or an is the first column; for rows 220 to 319 and 333-500, column t is the first column; and for rows 320 to 332, column aa or da is the first column. The companies also file printed copies of their submissions where rows 110-121 are designated as Table I, rows 130-170 are designated as Table II, rows 180-190 are designated as Table III, rows 200-214 are designated as Table IV, rows 220-319 and 333-500 are designated as Table IV-A, and rows 320-332 are designated as Table V. Note that some of the row numbers in the data such as rows 142, 143 and 160 do not appear in numerical order. In addition to definitional wording changes, most of which are minor, rows 111, 131, 160 and 170 (missed installations for customer reasons and subsequent trouble reports) have been added with the 1997 data; however, not all companies have populated the added rows. Many column designations have also been changed and most column labels are now preceded by the letter "a". The reader should note that there are variations in numbers of switches and access lines in the various ARMIS reports that may lead to inconsistencies when comparing data sources; however, these variations are not believed to be significant enough to alter the observations made in this section. Because the entire row and column descriptions and definitions for each year in question are too voluminous to reproduce here, the reader should refer to the relevant Commission Order referenced in a prior footnote describing requirements for the specific data year of interest.

Average time (in hours) for the company to repair access lines and service subcategories for switched access, high-speed special access, and all special access. Only data for switched and special access services provided to carriers are presented. (See row 121, column a and c or aa and ac.)

4. Initial Trouble Reports per Thousand Access Lines

   Calculated as the total count of trouble reports reported as "initial trouble reports," divided by the number of access lines in thousands. (Note that multiple calls within a 30 day period associated with the same problem are counted as a single initial trouble, and the number of access lines reported and used in the calculation is the total number of access lines divided by 1,000.) This item is subcategorized by Metropolitan Statistical Areas (MSA) (the sum of row 141, column d or ad and row 141, column g or ag divided by the sum of row 140, column d or ad and row 140, column g or ag); non-MSA (the sum of row 141, column e or ae and row 141, column h or ah divided by the sum of row 140, column e or ae and row 140, column h or ah); residence (row 141, column f or af divided by row 140, column f or af); and business (row 141, column i divided by row 140, column i or ai). Note that access lines for data filed in 1997 were requested in whole numbers, but were requested in thousands for prior years.

5. Found or Verified Troubles per Thousand Access Lines

   Calculated as described in item 4, above. Represents the number of trouble reports in which the company identified a problem (row 141, column j or aj less row 143, column j or aj divided by row 140, column j or aj).

6. Repeat Troubles as a percent of Initial Trouble Reports

   Calculated as the number of initial trouble reports acted on that recur, or remain unresolved, within 30 days of the initial trouble report, divided by the number of initial trouble reports as described above (row 142, column j or aj divided by row 141, column j or aj). Provides a measure of the effectiveness of the company in resolving troubles at the outset. Subcategorized by MSA, non-MSA, residence, and business. (Also refer to the discussion of data qualifications that follows.)

7. Complaints per Million Access Lines

   The number of residential and business customer complaints, per million access lines, reported to state or federal regulatory bodies during the reporting period. (Total residence complaints are calculated as the sum of row 331, column aa and row 332, column aa; total business complaints are calculated as the sum of row 321, column aa or da and row 322, column aa or da).

8. Number of Access Lines, Trunk Groups and Switches

The count of in-service access lines (row 140, column j or aj), trunk groups (row 180, column k or ak), and switches (the sum of row 200, column n or an and row 201, column n or an or the sum of row 210, column n or an through row 214, column n or an). Ttrunk groups only include common trunk groups between Local Exchange Carrier (LEC) access tandems and LEC end offices. When comparing current data herein with data in prior reports the reader should note that access lines were reported in thousands in pre 1997 data submissions. Starting with 1997 data submissions access line data was requested in whole numbers. Data for 1995 was annualized as the average of quarterly data.

9. Switches with Downtime

Number of network switches experiencing downtime and the percentage of the total number of company network switches experiencing downtime (row 210, column o or ao through row 214, column o or ao or the sum of row 200, column o or ao and row 201, column o or ao).

10. Average Switch Downtime in Seconds per Switch

Total switch downtime divided by the total number of company network switches indicates the average switch downtime in seconds per switch. Shown for all occurrences (the sum of row 200, column p or ap and row 201, column p or ap, multiplied by 60 and divided by the sum of row 200, column n or an and row 201, column n or an) and for unscheduled occurrences greater than 2 minutes (data derived from rows 220 through 319 and rows 333 through 500, columns t through z in the source data divided by the sum of rows 200 and 201, column n or an).

11. Unscheduled Downtime Over 2 Minutes per Occurrence

Number of occurrences of more than 2 minutes in duration that were unscheduled, the number of occurrences per million access lines, the average number of minutes per occurrence, the average number of lines affected per occurrence, the average number of line-minutes per occurrence in thousands, and the outage line-minutes per access line. For each outage, the number of lines affected was multiplied by the duration of the outage to provide the line-minutes of outage. The resulting sum of these data represents total outage line-minutes. This number was divided by the total number of access lines to provide line-minutes-per-access-line, and, by the number of occurrences, to provide the line-minutes-per-occurrence. This categorizes the normalized magnitude of the outage in two ways and provides a realistic means to compare the impact of such outages between companies. A separate table is provided for each company showing the number of outages and outage line-minutes by cause. (These items are derived from data in rows 220 through 319 and 333 through 500, columns t through z, in the source data).

12. Scheduled Downtime Over 2 Minutes per Occurrence

Determined as in item 11, above, except that it consists of scheduled occurrences. (These items are derived from data contained on rows 220 through 319, and rows 333 through 500, columns t through z, in the source data).

13. Percent of Trunk Groups Meeting Design Objectives

This data item provides the percentage of trunk groups exceeding an industry standard for blocking over the reporting interval (the sum of rows 189 and 190, column k, divided by row 180, column k for 1995 data and the sum of rows 189 and 190, column ak divided by row 180 column ak starting with 1996 data). The trunk groups measured and reported are interexchange access facilities. These represent only a small portion of the total trunk groups in service.

Qualifications

The data presented in this section are a first view of recently filed. As in the past we have identified several pitfalls and general qualifications in using quality of service data that are presented below.

Overall, we caution readers to be aware of potential methodological shortcomings and inconsistencies associated with use of the service quality data presented in this section. First, carriers periodically revise submitted data as problems are discovered and data presented here may contain errors or may not reflect the latest updates. Second, although the data are subject to an initial screening by Commission staff and certain problems may have been corrected in carrier-submitted revised filings, there are still potential flaws in the data that will only become apparent when users subject the data to further analysis or compare it with data from other sources.[12]

Third, Commission staff have recalculated holding company totals or data composites and these might not match company-filed totals or composites.[13] This is primarily due to

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12 For example, small variations between GTE prepared composites and those that we calculated independently appear to have been caused by inclusion or exclusion of data from study areas such as Micronesia (GTMC) and Alaska (GTAK).

13 Recent Commission orders have modified definitions in the data collection process in an attempt to remove perceived ambiguities. We note, however, that because this section contains many items whose composites are calculated as weighted sums or averages, we have recalculated company composites for this section to improve consistency and we have pointed out general cautions in using the data. We expect that this will be useful to the companies in their review of internal processes associated with calculation of composites and may enable us to use company-calculated composites in the future.

calculation variations regarding, *e.g.*, percentages or average intervals that require weighting in the calculations. Carriers have updated earlier filings numerous times. The data presented here typically reflect data updates to the most recent ARMIS filing of April 2000. We therefore caution the reader that some of the problems that may be discovered in connection with the data presented here resulted from differences in aggregation methodologies, errors including data irregularities, or data revisions that either could not be used or were not available in time for use in this section.[14]

Fourth, outage measurements should be considered in context. For example, the average number of lines affected per event would tend to favor a company with a larger number of smaller or remote switches with lower line counts per switch, while the average outage duration might favor a company with larger switches. Thus, using the average number of lines per event measurement, one 25,000 line switch that is out of service for five minutes would appear to have a greater service impact than ten 2,500 line switches that are out of service for five minutes. That is why we present a grouping of outage measurements that include the outage line-minutes per event and per 1,000 access lines. We have also added the number of outages per switch as another metric for measuring a company's performance.

Except in the calculation of company composites, we have not, in most cases, deleted or adjusted data. It is expected that the process of data correction will continue as problems are further identified and corrected.

This section presents data that reflect several different ways of measuring switch outages, including line-minutes-per-access line and line-minutes-per-event. Outage line-minutes is a measure that combines both duration and number of lines affected in a single parameter. We derived this parameter from the raw data by simply multiplying the number of lines involved in each outage by the duration of the outage, summing the resulting values and dividing the sum by the total number of access lines or events. Because outage measurements tend to exhibit more variability than other measurements, we have shown in the tables several ways of presenting the results. Improvements in responding to outages by some of the reporting companies may be associated with efforts to improve switch reliability, including working with manufacturers to replace poorly performing switches and to improve performance of existing ones.[15]

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14 We have noted in some cases that total access lines as reported in the last column of row 140 does not agree with the sum of the first column entry of rows 320 and 330. Variations in access line and switch counts may affect normalized outage data reported in the tables. In some instances irregularities inherent in the underlying data at the study area level may have resulted in other undetected errors in the calculated composites.

15 GTE representatives previously expressed concerns about presentation of its outage data in this section, asserting that the raw number of outages taken out of context would result in GTE appearing worse than other companies due to the large number of small and remote switches in its territory. The use of a menu of data elements as a description of outage performance actually tends to portray performance more equitably for all companies and reduces reporting bias that would tend to result from a more limited

Because performance within any single data category may vary widely over time, evaluating a given company's performance by looking at a single measurement may be misleading, especially considering that long lead times might be needed to correct certain problems or that corrections might already be underway. On the other hand, problems that are observed in several service quality measurement categories could also reflect overall service deterioration. We believe that customer complaint and perception levels should be viewed in the context of other measures of performance. However, we have found that it is practically impossible to ascertain whether changes in aggregate customer complaint levels result from developments in a single problem area or reflect a perception of a wider ranging set of problems. For these reasons and because data is now filed annually rather than quarterly we recommend the use of both trend and pattern analysis of the data.

Finally, one of the measurements for which service quality data are collected is the number of service affecting troubles reported by customers. Because of the various classifications of trouble reports, the Commission's May 1997 Order addressed problems relating to subtleties in the definitions associated with the terms "initial" and "repeat" trouble reports.[16] This and other issues were addressed in an October 1993 Order modifying filing requirements and were the subject of further clarification and expansion in subsequent orders leading to the reporting of a new category of recurring trouble reports.[17]

All of these reflections and observations essentially relate to the issue of maintaining the necessary continuity of data measurements. While an attempt has been made to preserve continuity up to this point, detection of errors and changes in reporting requirements that are deemed necessary will introduce discontinuities into certain time series data or eliminate certain items of data entirely.

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description of the data.

16 This issue was discussed in the last report on service quality and was addressed in recent Commission orders. *See Policy and Rules Concerning Rates for Dominant Carriers*, Memorandum Opinion and Order, 12 FCC Rcd 8115, 8133 (rel. May 30, 1997); *Revision of ARMIS Annual Summary Report (FCC Report 43-01) et al.*, Order, 12 FCC Rcd 21831, 21835 (Com. Car. Bur., rel. Dec. 16, 1997). *See also* Federal Communications Commission, Industry Analysis Division, *Quality-of-Service for the Local Operating Companies Aggregated to the Holding Company Level*, released March 22, 1996 (mimeo 60268) for further discussion.

17 *See Policy and Rules Concerning Rates for Dominant Carriers*, Memorandum Opinion and Order, 8 FCC Rcd 7474, ¶ 26 and attachments (1993). *See also Revision of ARMIS Annual Summary Report (FCC Report 43-01) et al.*, 12 FCC Rcd 21831 (introducing reporting of "subsequent" troubles).

We note that changes in service quality measurements may be dictated by changes in technology and that the companies periodically wish to change their internal measurement procedures, from which regulatory data are drawn, adding difficulty to long-term measurements.[18] In some cases procedural changes in the data measurement and collection process may be subtle enough so that they are not immediately noticeable in the data. Significant changes in company procedures, however, usually result in noticeable and abrupt changes in data levels. It appears that at least some of these changes are not reported to the Commission. These factors tend to limit the number of years of data available to track service quality trends and will affect the frequency and availability of summary reports that are prepared by the Commission. Although the Commission has made every effort to standardize and rationalize data reporting over the years, given the number of changes to the reporting regimes and predictable future changes, one should not assume exact comparability on all measurements for data sets as they are presented year by year.

It is our experience that service reliability data are, by their nature, subject to a greater volatility than other types of company data. As a general rule, one should be cautious about interpreting individual measurements until one develops a sense of what the data measurements disclose about company performance.

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18 For those interested in trending customer perception data in this section with that available in prior Reports it should be noted that Bell Atlantic, for example, reported changes to its customer perception surveys that were reflected in its post-1990 data, and Pacific Telesis had noted changes effective in January 1992.

Table 9.1: Company Comparison -- Installation, Maintenance, & Customer Complaints -- 1999

Company	Bell Atlantic North	Bell Atlantic South	BellSouth	SBC Ameritech	SBC Pacific	SBC Southwestern	US West	GTE	Sprint
ACCESS SERVICES PROVIDED TO CARRIERS -- SWITCHED ACCESS									
Percent Installation Commitments Met	97.7	94.2	96.2	91.4	60.7	64.0	86.5	95.7	82.3
Average Installation Interval (days)	41.4	25.7	26.0	70.1	26.8	27.8	41.0	29.5	2.7
Average Repair Interval (hours)	3.2	4.9	2.6	25.7	11.9	4.3	9.7	5.2	13.5
ACCESS SERVICES PROVIDED TO CARRIERS -- SPECIAL ACCESS									
Percent Installation Commitments Met	84.0	85.4	85.1	93.6	74.9	97.0	84.0	90.6	80.0
Average Installation Interval (days)	20.4	15.1	15.9	15.7	22.3	0.0	23.3	20.6	9.8
Average Repair Interval (hours)	4.0	4.2	4.4	3.0	4.4	2.7	4.4	7.9	13.5
LOCAL SERVICES PROVIDED TO RESIDENTIAL AND BUSINESS CUSTOMERS									
Percent Installation Commitments Met	98.3	97.7	97.3	98.9	98.9	98.5	98.2	98.3	97.7
Residence	98.5	98.3	97.8	99.0	99.0	98.6	98.5	95.5	97.9
Business	97.0	94.0	91.8	97.7	98.0	97.8	96.1	98.6	96.1
Average Installation Interval (days)	1.2	2.2	1.4	2.2	1.8	0.9	1.7	1.6	4.7
Residence	1.1	2.1	1.2	2.1	1.5	0.8	1.4	1.4	4.5
Business	1.8	3.2	2.6	2.9	3.7	1.1	3.2	3.4	5.9
Initial Trouble Reports per Thousand Lines	182.6	156.1	287.8	208.3	153.3	205.1	202.2	173.7	235.8
Total MSA	184.3	157.4	272.5	204.9	152.0	178.2	201.8	166.5	230.1
Total Non MSA	170.6	140.6	379.2	255.1	188.7	346.5	203.7	192.6	247.4
Total Residence	222.8	198.2	336.9	263.2	205.8	245.2	246.5	201.7	277.7
Total Business	108.4	82.1	173.9	110.1	72.1	112.9	109.2	108.2	127.8
Troubles Found per Thousand Lines	131.2	105.1	144.1	147.4	106.6	142.6	141.3	173.4	144.2
Repeat Troubles as a Pct. of Trouble Rpts.	20.1%	22.0%	19.9%	18.1%	16.0%	14.3%	38.4%	NA	13.6%
Total Residence	20.2%	22.5%	20.6%	18.6%	16.3%	14.6%	38.0%	NA	14.0%
Total Business	19.6%	19.9%	16.9%	16.0%	14.8%	12.9%	40.3%	NA	11.1%
Res. Complaints per Mill. Res. Access Lines	263.3	402.6	265.4	312.4	57.0	44.3	1,053.1	131.1	249.4
Bus.Complaints per Mill. Bus. Access Lines	146.6	77.7	120.4	44.4	15.2	12.8	391.1	41.1	118.3

Please refer to text for notes and data qualifications

Table 9.2: Company Comparision -- Switch Downtime & Trunk Blocking -- 1999

Company	Bell Atlantic North	Bell Atlantic South	BellSouth	SBC Ameritech	SBC Pacific	SBC Southwestern	US West	GTE	Sprint
Total Access Lines in Thousands	19,103	22,730	24,458	21,036	18,285	16,287	17,449	20,015	7,879
Total Trunk Groups	1,054	1,090	3,712	1,289	2,089	932	2,920	2,494	4,697
Total Switches	1,297	1,339	1,649	1,432	799	1,658	1,428	4,531	1,359
Switches with Downtime									
Number of Switches	65	59	137	336	109	285	1,107	154	171
As a percentage of Total Switches	5.0%	4.4%	8.3%	23.5%	13.6%	17.2%	77.5%	3.4%	12.6%
Average Switch Downtime in seconds per Switch									
For All Events	59.5	49.7	168.2	61.1	4.4	36.1	214.1	215.4	739.6
For Unscheduled Events Over 2 Minutes	53.1	47.3	158.7	32.0	165.2	3.6	134.7	214.2	665.8
For Unscheduled Downtime More than 2 Minutes									
Number of Occurrences or Events	20	22	98	39	5	10	90	151	119
Events per Hundred Switches	1.5	1.6	5.9	2.7	0.6	0.6	6.3	3.3	8.8
Events per Million Access Lines	1.05	0.97	4.01	1.85	0.27	0.61	5.16	7.54	15.10
Average Outage Duration in Minutes	57.4	48.0	44.5	19.6	440.0	10.0	35.6	107.1	126.7
Average Lines Affected per Event in Thousands	19.0	27.5	20.2	31.3	38.5	42.9	8.8	3.2	4.3
Outage Line-Minutes per Event in Thousands	835.4	1,711.9	602.0	662.5	15,377.5	342.3	515.6	154.1	538.3
Outage Line-Minutes per 1,000 Access Lines	874.6	1,656.9	2,412.1	1,228.2	4,204.9	210.2	2,659.1	1,162.3	8,129.4
For Scheduled Downtime More than 2 Minutes									
Number of Occurrences or Events	18	5	28	22	4	38	469	2	85
Events per Hundred Switches	1.4	0.4	1.7	1.5	0.5	2.3	32.8	0.0	6.3
Events per Million Access Lines	0.94	0.22	1.14	1.05	0.22	2.33	26.88	0.10	10.79
Average Outage Duration in Minutes	6.1	3.3	6.4	23.0	257.7	5.1	2.3	3.6	19.7
Avg. Lines Affected per Event in Thousands	41.1	32.1	21.9	20.5	48.9	38.7	10.4	9.5	10.9
Outage Line-Minutes per Event in Thousands	241.1	106.9	115.2	120.1	19,180.8	178.8	24.9	33.8	164.6
Outage Line-Minutes per 1,000 Access Lines	227.1	23.5	131.9	125.6	4,195.9	417.1	670.1	3.4	1,775.5
% Trunk Grps. Exceeding Blocking Objectives	5.50%	20.73%	3.80%	0.93%	4.88%	1.29%	8.63%	0.64%	1.11%

Please refer to text for notes and data qualifications

Table 9.3: Company Comparison -- Switch Downtime Causes -- 1999

Company	Bell Atlantic North	Bell Atlantic South	BellSouth	SBC Ameritech	SBC Pacific	SBC Southwestern	US West	GTE	Sprint
TOTAL NUMBER OF OUTAGES									
1. Scheduled	18	5	28	22	4	38	469	2	85
2. Proced. Errors -- Telco. (Inst./Maint.)	5	3	0	2	2	2	3	8	16
3. Proced. Errors -- Telco. (Other)	0	1	12	5	0	2	1	6	1
4. Procedural Errors -- System Vendors	1	2	12	8	1	1	2	1	1
5. Procedural Errors -- Other Vendors	1	0	3	0	0	0	1	9	5
6. Software Design	1	4	34	17	0	1	41	16	5
7. Hardware design	0	0	4	0	0	0	4	0	0
8. Hardware Failure	5	5	26	7	0	1	29	69	33
9. Natural Causes	0	1	1	0	0	0	0	10	7
10. Traffic Overload	0	0	0	0	0	0	0	0	0
11. Environmental	0	1	0	0	0	0	0	1	1
12. External Power Failure	2	0	3	0	0	0	6	30	8
13. Massive Line Outage	0	0	0	0	0	0	0	0	13
14. Remote	1	1	0	0	0	0	1	1	13
15. Other/Unknown	4	4	3	0	2	3	2	0	16
TOTAL OUTAGE LINE-MINUTES PER THOUSAND ACCESS LINES									
1. Scheduled	227.1	23.5	131.9	125.6	4195.9	417.1	670.1	3.4	1775.5
2. Proced. Errors -- Telco. (Inst./Maint.)	463.0	168.8	0.0	10.8	1967.9	15.2	1934.3	21.0	2058.1
3. Proced. Errors -- Telco. (Other)	0.0	6.2	81.3	382.9	0.0	82.0	3.3	36.9	2.8
4. Procedural Errors -- System Vendors	5.6	54.5	248.2	278.3	1472.8	3.6	1.8	0.3	768.5
5. Procedural Errors -- Other Vendors	1.0	0.0	13.8	0.0	0.0	0.0	8.5	96.6	200.2
6. Software Design	6.0	39.1	752.6	433.7	0.0	10.8	233.8	123.3	1133.3
7. Hardware design	0.0	0.0	13.7	0.0	0.0	0.0	10.3	0.0	0.0
8. Hardware Failure	87.0	102.7	416.0	122.5	0.0	8.3	219.0	565.4	1466.4
9. Natural Causes	0.0	1252.7	0.6	0.0	0.0	0.0	0.0	148.0	478.0
10. Traffic Overload	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. Environmental	0.0	25.6	0.0	0.0	0.0	0.0	0.0	55.1	2.7
12. External Power Failure	204.3	0.0	794.2	0.0	0.0	0.0	240.6	110.6	295.1
13. Massive Line Outage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1256.9
14. Remote	15.7	0.5	0.0	0.0	0.0	0.0	2.9	5.3	106.9
15. Other/Unknown	92.1	6.8	91.6	0.0	764.2	90.2	4.7	0.0	360.5

Please refer to text for notes and data qualifications

Table 9.4: Company Comparision -- 1999 Customer Perception Surveys

Company	Bell Atlantic North	Bell Atlantic South	BellSouth	SBC Ameritech	SBC Pacific	SBC Southwestern	US West	GTE
Percentage of Customers Dissatisfied								
Installations:								
Residential	5.06	5.66	9.15	7.80	16.34	5.70	7.08	7.08
Small Business	9.46	8.57	8.21	11.30	16.10	7.39	17.40	12.53
Large Business	7.19	10.26	6.06	NA	17.05	7.38	NA	3.27
Repairs:								
Residential	13.87	15.84	15.09	15.30	23.77	7.94	12.97	11.59
Small Business	10.79	13.00	10.73	14.08	16.81	5.98	16.05	12.22
Large Business	10.00	13.02	6.77	NA	19.50	8.12	NA	2.59
Business Office:								
Residential	7.43	5.65	8.39	8.63	13.94	6.54	2.78	1.81
Small Business	8.27	9.94	10.63	14.21	17.37	7.37	6.85	3.44
Large Business	7.55	10.82	6.34	5.17	15.10	5.58	NA	0.90

Please refer to text for notes and data qualifications

Table 9.5: Company Comparision -- 1999 Customer Perception Surveys

Company	Bell Atlantic North	Bell Atlantic South	BellSouth	SBC Ameritech	SBC Pacific	SBC Southwestern	US West	GTE
Sample Sizes -- Customer Perception Surveys								
Installations:								
Residential	14,730	10,066	37,611	29,324	15,682	9,365	17,826	21,337
Small Business	14,941	10,590	18,254	27,211	13,470	13,942	7,382	21,413
Large Business	2,019	1,345	NA	NA	4,466	6,112	NA	825
Repairs:								
Residential	14,729	10,042	29,489	28,457	16,108	18,634	11,309	21,345
Small Business	15,105	10,617	20,714	27,986	15,193	14,066	2,706	21,539
Large Business	1,960	1,248	NA	NA	3,813	5,264	NA	754
Business Office:								
Residential	15,995	19,599	27,513	49,513	15,985	27,909	8,509	20,711
Small Business	5,051	6,631	9,798	5,873	26,894	27,627	5,493	14,027
Large Business	1,365	961	962	1,141	6,654	2,062	NA	781

Please refer to text for notes and data qualifications

10. Infrastructure

The infrastructure information contained in this report is based upon data collected by the FCC as part of its price-cap monitoring procedures.[1] This summary is intended to highlight changes in the use of technology in the local telephone company plant.

The data (ARMIS 43-07 reports[2]) upon which this infrastructure summary is based are filed April 1 for the previous calendar year. This infrastructure report includes data through 1999.[3] The most recent data were filed in April 2000.

Background

The data items presented here summarize ARMIS Report 43-07, which is filed by local exchange carriers subject to mandatory price-cap regulation. The information contained in this report is for the years 1991 through 1999.

The ARMIS 43-07 reports are filed only by those local exchange companies originally subject to mandatory price-cap regulation--the Bell operating companies (BOCs) and the telephone operating companies owned by GTE.[4] Together, these large companies provide service to more than 90% of the nation's telephone lines. The data are generally filed at the study area level, which typically consists of a company's operations within a state. The state-by-state data are available from the Commission's ARMIS web page at http://www.fcc.gov/ccb/armis/db/ on the World Wide Web.

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1 These procedures were established in CC Docket No. 87-313.

2 ARMIS, an acronym for Automated Reporting Management Information System, is a publicly available repository of financial, plant, demand, and quality-of-service data. Additional infrastructure data are contained in the ARMIS 43-08 report. See *Statistics of Communications Common Carriers,* published annually by the FCC's Industry Analysis Division for a compilation of 43-08 infrastructure data.

3 See *Infrastructure of the Local Operating Companies Aggregated to the Holding Company Level,* released April 24, 1994 for data for the years 1989 and 1990. Those early years have not been included in this report because some of the data apparently contain discrepancies and are inconsistent with the later years. Reports containing data for the early years can be found in the infrastructure section of the FCC-State Link internet site at http://www.fcc.gov/ccb/stats on the World Wide Web under the file names INFRA99.ZIP, INFRA98.ZIP, INFRA95.ZIP, and INFRA93.ZIP.

4 See *Policy and Rules Concerning Rates for Dominant Carriers,* CC Docket No. 87-313, 5 FCC Rcd 6786 (1990) (LEC Price Cap Order), *Erratum*, 5 FCC Rcd 7664 (1990), and 8 FCC Rcd 7474 (1993).

The information summarized in this report is organized into two tables: Table 10.1 shows switching system data and gross plant expenditures covering all types of plant. Table 10.2 shows transmission system data. Each table contains segments for each of the regional Bell operating companies, one for the companies owned by GTE, and two that summarize data for all the BOCs and all reporting companies. The data summarized for each holding company reflect the aggregate of data filed for individual states or study areas and should be useful in assessing overall trends.

In some cases, refiled data may cause values to differ from prior summary reports. Totals associated with GTE and Contel entities have been aggregated into a single GTE composite. Similarly, NYNEX data are included in the Bell Atlantic Total Company data.

Description of the Technologies and Analysis of the Data

The data in the attached tables provide a historical series for a variety of plant elements that illustrate the deployment of technology in the networks of the major local exchange carriers.[5] The data items provide a picture of the technologies currently in use. For example, although the issue of fiber in the local loop has gained a great deal of attention because of its potential for facilitating development of wideband video services, the progression of lower data-rate digital technologies to greater numbers of customers through an increased use of digital local access has been occurring for some time. Both switching and transmission technologies provide the building blocks that make this possible. In the switch, Signaling System 7 (SS7) provides a means for networks and interoffice switches to communicate with each other. This system uses separate digital links outside the voice channel to accomplish this. Other elements in the data relating to equal access switches and touch-tone capable switches show that nearly all switches now are equipped for both equal access and touch-tone dialing.

A useful overall measure of company activity is the dollar amount of total gross capital expenditures, which increased about 14% for the BOCs in 1999 and 2.5% in 1998. The data reported includes all plant additions on both switching and transmission facilities motivated by modernization, replacement and growth .[6] Total gross capital expenditures should therefore continue to be an important overall parameter in assessing deployment of infrastructure in the local service business. Because construction expenditures may ultimately affect quality of service levels, broad long term changes in the relationship between construction expenditures and access line growth should be of continued interest.

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5 A number of irregularities including several time series anomalies were noted in the data. Not all data revisions were available in time for inclusion in this report. GTE indicates that at least some of the discrepancies have resulted from system changes made to its data collection systems over the past year. BellSouth indicates that ISDN capable line data (row 490) reflects a change in methodology. Prior data was based on equipped central office pairs. Data for 1999 is based on working lines.

6 The data is provided as a single number in the ARMIS 43-07 report and includes additions to plant accounts 2110, 2210, 2220, 2230, 2310, 2410, 2680, and 2690.

Although there is considerable interest in digital switching, the term "digital switch" by itself is often misleading and does not address the important issues of switching capability and modularity which allows for lower-cost upgrading and capacity expansion. For example, while most network switches are currently classified as digital stored-program-controlled-switches, this classification by itself does not indicate whether the switch has ISDN or SS7 capability and does not address the issue of modularity that allows lower-cost expansion. Because there are multiple capabilities that may be available in modern digital switches, assessment of digital switching proliferation requires one to look at more than a single statistic. While there are no across-the-board relationships between modularity and switch capability, many of the switches with ISDN capability also tend to be modular in design and can often be upgraded with software that can facilitate lower-cost expansion. ARMIS data currently mandated and being collected only cover circuit switches that provide a dedicated path through the network for the duration of a call, not routers or switches that are used in connection with frame relay, ATM and internet services that are specifically designed to handle data packets or bursts. Information on call routers (packet switches), frame relay and ATM switches is not currently collected but would more accurately portray deployment of current technology than the simple digital/analog categories

ISDN technology provides the service protocols and channel designations for digital services to customers and can convey voice, computer data or compressed video. Basic-rate ISDN services are provided as two 64-kilobit data channels and one 16-kilobit control channel associated with each basic-rate access line. The control channels allow the transfer of special information between the switch and the customer, unavailable with in-band signaling, as well as advanced network-control features currently used in a number of enhanced services. Primary rate ISDN provides the capacity of twenty-three 64-kilobit data channels and one 64-kilobit control channel. Availability of the service is significant and expanding, and newer services are now available that offer broadband digital capability using special terminal equipment that enhances the capability of existing copper access lines.[7] Readers interested in more disaggregated information may wish to examine data at a more localized level than presented here.[8]

In the aggregate, there was a very small increase (less than 1%) in the number of ISDN-capable switches in 1999 following a 15% increase in 1998 and a 22% increase in 1997. The number of ISDN-capable switches has doubled since 1994 and has gone up more than five-fold since 1991 but now with the availability of xDSL access technologies ISDN appears to be

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7 These services are generally referred to as xDSL (Digital Subscriber Loop) services. Limited data on the proliferation of xDSL terminal equipment by incumbent carriers are contained in Table 8 of our most recent *Fiber Deployment Update*, released September 9, 1999.

8 Individual study-area data are also available to address more localized issues. This information is available on the ARMIS Web page at http://www.fcc.gov/ccb/armis/db/on the World Wide Web.

growing much more slowly.[9] Although switch capabilities and modularity tend to vary by vendor, these switches tend to be better able to deal with the changing characteristics of telecommunication traffic.[10]

The companies typically report the number of access lines that can be connected to ISDN service within each wire center or switch. Because ISDN is a digital service, it is equipped to handle communication between computers without the need to first convert the signal to an analog form. Early on it was primarily marketed as a medium for enhanced voice services and was primarily targeted to business users. It has become an increasingly attractive alternative for residential customers and small businesses needing a second line for a computer, and therefore its pricing in relation to the cost of two analog lines can significantly affect proliferation of the service. Not all transmission lines are capable of ISDN or higher rate digital operation. Thus, information on lines capable of handling ISDN data rates was added to the ARMIS 43-07 filing requirements starting with end-of-year 1997 data. This data will be helpful in assessing the capability of existing incumbent carriers to provide basic digital services and is included with this year's summary.

Many of the companies had installed digital switches in response to the equal-access requirements of divestiture. Today, nearly 100% of the Bell company switching entities have equal-access. Although 98% of the BOCs' switches are digital stored-program-controlled switches, only about one-third have ISDN capability. The companies generally have been responding to increased interest in ISDN service and internet use by replacing or upgrading existing switches for ISDN capability.[11]

A number of transmission elements are included in the tables. These illustrate the rapid development of fiber capacity in terms of terminations, sheath kilometers, and links. The number of sheath kilometers of fiber has more than doubled from 1991-1999, with over a half

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9 The companies can promote network modernization along with the systematic growth of high bandwidth services by attracting new customers to digital services with a wider range of digital consumer choices at a variety of data rates and cost. Data trends suggest that rate adjustments and service offerings that promote ISDN as an entry level digital alternative to the broader bandwidth xDSL services might be an effective way to increase the overall market for digital services and allow greater penetration of digital facilities in less urbanized areas. New service offerings at ISDN data rates, could, for example, include a lower cost entry-level non-switched digital service geared to internet users.

10 Continuing changes in demand patterns for new access lines, and in the character of telephone traffic from pure voice traffic to a changing mix of voice and data, underscore the desirability of targeted improvement to the switching infrastructure. Use of easily upgradeable switching systems will be increasingly important.

11 New marketing, pricing and regulatory approaches designed to promote greater ISDN use by smaller business and residential customers will also promote the use of broadband capabilities and result in improvements to the local infrastructure.

million fiber sheath kilometers being reported in 1999. The number of sheath kilometers of copper has remained steady at about 5.2 million and other sheath data, in relative terms, are not significant.

Table 10.2 also highlights the relative magnitude of equipped and working channels, providing an indication of termination equipment utilization. In both cases, copper has grown about 15% from 1991 to 1999, whereas fiber has increased over five-fold. Analog links have almost disappeared, and the number of interoffice fiber carrier links has surpassed the number of copper carrier links. Although data on links and channels show that circuits connecting local central offices could typically be provided on only two fibers, the economics of fiber deployment have resulted in deployments of typical fiber cables containing more than 40 fibers. This suggests that there is a significant amount of fiber capacity currently unused in the *interoffice* transmission plant.[12]

Although the overall level of growth in fiber has been high, its use in the local loop at present is relatively small. The BOCs had an installed base of about 189 million copper-pair mainframe terminations in their central offices for local loop use in 1999. About 2 million BOC fiber terminations had been installed by end-of-year 1999. The data show that growth in central office fiber terminations increased about 10% during 1999 as compared to about 21% in 1998; however customer DS-1 and DS-3 terminations on fiber facilities increased dramatically in 1999 as compared to 1998. Over the longer term, fiber and hybrid copper/fiber systems will likely become increasingly important in the local loop as the number of high-quality copper pairs available to support digital services declines.

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12 A large portion of the cost of fiber deployment is associated with labor and installation rather than with the cable itself. Thus, the incremental cost of installing a larger fiber cable is typically relatively small. This suggests that the sheath-kilometer parameter shown in the attached tables may be a better measure of fiber coverage than fiber kilometers. In general, care should be exercised in interpreting aggregate fiber data when determining, for example, whether fiber is concentrated in certain parts of a company's service area with relatively little fiber elsewhere. See *FCC Fiber Deployment Update - End of Year 1998*, released September 9, 1999.

Table 10.1 Switching Data
Total - All Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$17,286	$17,292	$17,384	$17,405	$18,009	$20,122	$21,233	$21,847	$24,299
Local Switches	16,251	16,506	16,650	16,017	16,157	16,267	16,186	16,117	16,261
Tandems	461	477	475	456	470	484	481	493	492
Hosts	2,000	2,217	2,366	2,309	2,382	2,432	2,515	2,471	2,461
Remotes (Stand Alone Only)	5,632	5,689	6,349	6,706	7,140	7,098	7,164	7,977	8,103
Total Switches	16,392	16,701	16,858	16,195	16,342	16,486	16,448	16,395	16,516
Electromechanical	2,610	1,954	1,493	1,029	739	394	168	0	0
Analog Stored Program Control	2,265	2,007	1,632	1,179	1,002	735	558	431	314
Digital Stored Program Control	11,517	12,739	13,733	13,987	14,601	15,356	15,722	15,964	16,202
Total Number Access Lines in Service (000)	123,022	125,776	129,642	133,409	138,907	143,239	150,043	155,530	159,364
Electromechanical Lines Served	3,310	1,977	1,348	912	596	286	157	0	0
Analog Stored Program Control Lines Served	54,838	49,989	42,746	33,699	29,409	24,803	21,416	16,688	11,713
Digital Stored Program Control Lines Served	64,873	73,815	85,549	98,799	108,903	118,149	128,470	138,842	147,651
Touch-Tone Capable Switches	16,137	16,506	16,697	16,017	16,199	16,267	16,185	16,117	16,262
Access Lines with Touch-Tone Capability (000)	122,849	125,776	129,642	133,376	138,870	143,239	150,043	155,530	159,364
Switches Equipped for Equal Access	11,607	14,211	15,096	15,055	15,600	15,967	16,245	16,374	16,475
Access Lines with Equal Access (000)	118,626	123,193	128,062	132,456	138,324	142,946	149,878	155,530	159,364
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	1,248	5,745	8,037	10,358	11,890	13,171	13,879	15,151	15,994
Lines with SS7-394 (InterLATA) Service (000)	23,377	71,033	96,117	118,616	129,232	137,458	146,677	154,022	158,475
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	4,091	7,434	8,845	10,584	11,907	13,504	13,903	15,173	16,010
Lines with SS7-317 (IntraLATA) Service (000)	62,193	85,559	102,208	120,239	129,436	137,778	146,743	154,125	158,533
Total Switches Equipped with ISDN	964	1,437	2,146	2,670	3,258	3,852	4,681	5,392	5,404
Lines with Access to ISDN (000)	21,295	29,775	41,970	61,549	77,523	95,113	106,575	121,408	127,030
Basic Rate ISDN (BRI) Interfaces Equipped	298,176	491,430	591,561	801,518	1,039,456	1,507,551	1,797,254	2,491,509	2,720,871
Primary Rate ISDN (PRI) Interfaces Equipped	1,730	3,147	5,816	15,526	32,580	67,885	136,233	234,515	334,910

Table 10.1 Switching Data
Total - Bell Operating Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$14,502	$14,629	$14,683	$14,667	$15,436	$17,494	$18,212	$18,663	$21,317
Local Switches	9,829	9,909	9,919	9,862	9,883	9,768	9,733	9,579	9,602
Tandems	302	315	317	313	313	318	316	331	328
Hosts	1,263	1,293	1,411	1,460	1,498	1,503	1,576	1,516	1,516
Remotes (Stand Alone Only)	3,584	4,131	4,617	4,939	5,109	5,173	5,204	5,239	5,242
Total Switches	9,951	10,069	10,089	10,023	10,051	9,966	9,965	9,791	9,825
Electromechanical	1,148	615	296	95	60	1	0	0	0
Analog Stored Program Control	2,167	1,924	1,554	1,133	976	718	548	431	314
Digital Stored Program Control	6,636	7,530	8,239	8,795	9,015	9,247	9,417	9,360	9,511
Total Number Access Lines in Service (000)	107,389	109,995	113,368	117,345	122,266	125,846	131,722	136,426	139,349
Electromechanical Lines Served	1,876	717	264	115	63	1	0	0	0
Analog Stored Program Control Lines Served	53,450	48,959	41,912	33,191	29,031	24,561	21,219	16,688	11,713
Digital Stored Program Control Lines Served	52,062	60,324	71,192	84,040	93,172	101,283	110,503	119,738	127,636
Touch-Tone Capable Switches	9,715	9,909	9,966	9,862	9,925	9,768	9,732	9,579	9,603
Access Lines with Touch-Tone Capability (000)	107,216	109,995	113,368	117,312	122,229	125,846	131,722	136,426	139,349
Switches Equipped for Equal Access	8,601	9,281	9,697	9,933	9,978	9,845	9,936	9,768	9,784
Access Lines with Equal Access (000)	105,415	109,007	112,993	117,266	122,210	125,845	131,722	136,426	139,349
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	1,248	4,246	6,003	8,108	8,960	9,274	9,664	9,624	9,685
Lines with SS7-394 (InterLATA) Service (000)	23,377	64,527	87,232	107,842	116,364	122,266	130,712	135,878	139,214
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	3,670	5,392	6,688	8,334	8,977	9,286	9,688	9,646	9,701
Lines with SS7-317 (IntraLATA) Service (000)	57,322	76,486	92,493	109,465	116,568	122,344	130,778	135,981	139,271
Total Switches Equipped with ISDN	920	1,219	1,874	2,400	2,868	3,329	3,902	4,146	4,352
Lines with Access to ISDN (000)	20,565	28,376	39,875	56,546	71,274	85,435	95,956	106,834	112,103
Basic Rate ISDN (BRI) Interfaces Equipped	289,292	468,667	560,820	738,506	948,130	1,409,406	1,670,308	2,352,038	2,552,907
Primary Rate ISDN (PRI) Interfaces Equipped	1,653	2,672	4,920	14,120	29,877	60,508	119,768	198,129	287,322

Table 10.1 Switching Data
Bell Atlantic Total

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$4,451	$4,113	$4,285	$4,315	$4,706	$5,030	$5,333	$5,670	$6,830
Local Switches	2,720	2,733	2,712	2,705	2,696	2,684	2,703	2,616	2,636
Tandems	72	65	65	65	65	71	67	67	74
Hosts	364	354	349	358	371	367	365	369	381
Remotes (Stand Alone Only)	1,170	1,329	1,365	1,407	1,424	1,444	1,447	1,405	1,437
Total Switches	2,750	2,768	2,747	2,738	2,729	2,723	2,737	2,655	2,682
Electromechanical	128	0	0	0	0	0	0	0	0
Analog Stored Program Control	541	463	349	246	194	137	86	37	16
Digital Stored Program Control	2,081	2,305	2,398	2,492	2,535	2,586	2,651	2,618	2,666
Total Number Access Lines in Service (000)	33,159	33,879	34,774	35,745	36,959	38,305	39,714	40,838	41,833
Electromechanical Lines Served	447	0	0	0	0	0	0	0	0
Analog Stored Program Control Lines Served	13,564	11,797	9,750	7,569	5,576	4,057	2,975	1,442	568
Digital Stored Program Control Lines Served	19,148	22,082	25,024	28,176	31,383	34,248	36,739	39,396	41,266
Touch-Tone Capable Switches	2,633	2,733	2,712	2,705	2,692	2,684	2,703	2,616	2,636
Access Lines with Touch-Tone Capability (000)	33,034	33,879	34,774	35,745	36,959	38,305	39,714	40,838	41,833
Switches Equipped for Equal Access	2,578	2,723	2,728	2,738	2,729	2,723	2,737	2,655	2,682
Access Lines with Equal Access (000)	32,833	33,787	34,722	35,745	36,959	38,305	39,714	40,838	41,833
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	161	1,183	1,690	2,381	2,577	2,650	2,707	2,644	2,671
Lines with SS7-394 (InterLATA) Service (000)	3,147	15,819	24,540	31,970	34,877	37,173	39,422	40,515	41,778
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	1,608	2,045	2,328	2,493	2,576	2,661	2,718	2,655	2,682
Lines with SS7-317 (IntraLATA) Service (000)	20,307	25,639	29,521	32,881	34,948	37,222	39,473	40,573	41,833
Total Switches Equipped with ISDN	359	409	629	839	930	1,079	1,220	1,298	1,306
Lines with Access to ISDN (000)	9,357	9,977	13,406	21,107	22,117	27,682	31,125	34,367	36,336
Basic Rate ISDN (BRI) Interfaces Equipped	42,409	132,307	164,380	282,051	363,320	505,652	660,542	1,088,060	1,167,022
Primary Rate ISDN (PRI) Interfaces Equipped	7	301	958	6,393	12,507	24,775	43,922	71,983	97,177

Table 10.1 Switching Data
BellSouth Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$2,841	$2,925	$3,012	$3,118	$3,160	$3,269	$3,477	$3,459	$4,317
Local Switches	1,666	1,664	1,661	1,658	1,647	1,650	1,654	1,653	1,649
Tandems	62	66	70	70	71	70	70	71	71
Hosts	270	272	269	280	289	297	317	307	306
Remotes (Stand Alone Only)	696	703	714	732	742	747	766	765	765
Total Switches	1,680	1,678	1,680	1,677	1,668	1,670	1,674	1,673	1,668
Electromechanical	0	0	0	0	0	0	0	0	0
Analog Stored Program Control	318	283	236	182	158	130	106	100	83
Digital Stored Program Control	1,362	1,395	1,444	1,495	1,510	1,540	1,568	1,573	1,585
Total Number Access Lines in Service (000)	17,972	18,607	19,233	20,141	21,064	22,019	23,080	23,909	24,458
Electromechanical Lines Served	0	0	0	0	0	0	0	0	0
Analog Stored Program Control Lines Served	7,726	7,173	5,929	4,837	4,455	4,020	3,746	3,536	2,972
Digital Stored Program Control Lines Served	10,246	11,434	13,304	15,304	16,609	17,999	19,334	20,373	21,486
Touch-Tone Capable Switches	1,666	1,664	1,661	1,658	1,647	1,650	1,654	1,653	1,649
Access Lines with Touch-Tone Capability (000)	17,972	18,607	19,233	20,141	21,064	22,019	23,080	23,909	24,458
Switches Equipped for Equal Access	1,680	1,678	1,680	1,677	1,668	1,670	1,674	1,673	1,668
Access Lines with Equal Access (000)	17,972	18,607	19,233	20,141	21,064	22,019	23,080	23,909	24,458
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	590	966	1,447	1,627	1,629	1,652	1,674	1,673	1,668
Lines with SS7-394 (InterLATA) Service (000)	9,391	14,231	18,067	20,118	20,737	21,874	23,080	23,909	24,458
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	956	1,121	1,452	1,628	1,630	1,652	1,674	1,673	1,668
Lines with SS7-317 (IntraLATA) Service (000)	14,635	15,959	18,122	20,136	20,755	21,874	23,080	23,909	24,458
Total Switches Equipped with ISDN	171	224	324	407	467	518	584	596	645
Lines with Access to ISDN (000)	3,319	4,934	7,606	9,708	10,988	12,948	14,894	15,980	17,413
Basic Rate ISDN (BRI) Interfaces Equipped	34,613	50,774	65,607	76,348	80,641	122,043	167,512	183,458	202,391
Primary Rate ISDN (PRI) Interfaces Equipped	282	559	1,814	3,534	4,803	9,154	21,389	33,564	51,669

Table 10.1 Switching Data
SBC -- Ameritech Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$1,877	$1,716	$1,719	$1,517	$1,578	$1,997	$1,912	$2,250	$2,244
Local Switches	1,421	1,433	1,422	1,413	1,415	1,410	1,435	1,419	1,432
Tandems	49	46	47	47	46	46	47	51	52
Hosts	224	178	230	236	238	236	243	236	234
Remotes (Stand Alone Only)	654	666	684	717	731	743	769	764	775
Total Switches	1,438	1,473	1,469	1,460	1,461	1,456	1,482	1,470	1,485
Electromechanical	46	0	0	0	0	0	0	0	0
Analog Stored Program Control	373	318	224	119	97	71	58	46	39
Digital Stored Program Control	1,019	1,155	1,245	1,341	1,364	1,385	1,424	1,424	1,446
Total Number Access Lines in Service (000)	16,634	16,887	17,500	18,122	19,310	19,553	20,335	20,790	21,036
Electromechanical Lines Served	65	6	0	0	0	0	0	0	0
Analog Stored Program Control Lines Served	9,076	7,898	5,862	3,845	3,727	3,228	2,793	2,193	1,811
Digital Stored Program Control Lines Served	7,492	8,988	11,638	14,278	15,583	16,324	17,541	18,597	19,225
Touch-Tone Capable Switches	1,394	1,433	1,469	1,413	1,461	1,410	1,434	1,419	1,433
Access Lines with Touch-Tone Capability (000)	16,586	16,887	17,500	18,122	19,310	19,553	20,335	20,790	21,036
Switches Equipped for Equal Access	1,390	1,459	1,469	1,450	1,461	1,410	1,482	1,470	1,484
Access Lines with Equal Access (000)	16,563	16,855	17,500	18,122	19,310	19,553	20,335	20,790	21,036
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	213	646	1,001	1,254	1,400	1,438	1,463	1,451	1,476
Lines with SS7-394 (InterLATA) Service (000)	4,779	9,099	13,376	16,482	18,538	19,293	20,266	20,694	20,998
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	502	818	1,116	1,347	1,417	1,439	1,463	1,462	1,481
Lines with SS7-317 (IntraLATA) Service (000)	7,662	9,838	13,961	17,217	18,653	19,322	20,280	20,739	21,001
									0
Total Switches Equipped with ISDN	108	181	387	444	489	601	695	784	816
Lines with Access to ISDN (000)	1,738	3,839	8,056	10,259	12,860	13,802	15,464	16,804	17,472
Basic Rate ISDN (BRI) Interfaces Equipped	55,890	56,352	67,415	87,862	97,550	226,355	180,280	220,867	259,312
Primary Rate ISDN (PRI) Interfaces Equipped	703	728	707	1,505	1,677	4,247	14,569	24,800	38,037

Table 10.1 Switching Data
SBC -- Pacific Telesis Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$1,688	$1,625	$1,734	$1,620	$1,664	$1,877	$2,209	$2,165	$2,354
Local Switches	842	853	846	837	840	833	810	801	799
Tandems	19	20	20	20	20	20	21	24	24
Hosts	102	103	111	121	117	114	135	121	116
Remotes (Stand Alone Only)	238	253	302	320	316	310	364	361	350
Total Switches	862	873	866	857	860	853	830	824	822
Electromechanical	4	3	3	2	1	0	0	0	0
Analog Stored Program Control	242	218	176	109	87	72	49	38	17
Digital Stored Program Control	616	652	687	746	772	781	781	786	805
Total Number Access Lines in Service (000)	14,381	14,661	14,971	15,417	16,021	16,460	17,155	18,158	18,285
Electromechanical Lines Served	1	1	1	1	0	0	0	0	0
Analog Stored Program Control Lines Served	8,557	8,128	7,036	5,029	4,036	3,354	2,422	1,825	754
Digital Stored Program Control Lines Served	5,823	6,532	7,934	10,387	11,985	13,106	14,733	16,333	17,531
Touch-Tone Capable Switches	842	853	846	837	840	833	810	801	799
Access Lines with Touch-Tone Capability (000)	14,381	14,661	14,971	15,384	15,984	16,460	17,155	18,158	18,285
Switches Equipped for Equal Access	832	844	844	834	838	852	810	801	799
Access Lines with Equal Access (000)	14,348	14,630	14,949	15,360	15,966	16,460	17,155	18,158	18,285
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	53	374	522	764	772	794	791	803	796
Lines with SS7-394 (InterLATA) Service (000)	1,161	9,638	12,490	14,781	15,512	15,616	16,956	18,134	18,285
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	253	374	522	764	772	794	804	803	796
Lines with SS7-317 (IntraLATA) Service (000)	7,190	9,638	12,490	14,781	15,512	15,616	16,956	18,134	18,285
Total Switches Equipped with ISDN	88	150	229	347	417	473	531	551	574
Lines with Access to ISDN (000)	1,567	2,905	5,349	8,494	10,291	11,895	13,632	15,134	16,202
Basic Rate ISDN (BRI) Interfaces Equipped	36,246	47,661	65,683	115,146	171,305	304,182	314,003	468,493	489,369
Primary Rate ISDN (PRI) Interfaces Equipped	113	308	357	708	3,491	13,448	20,125	31,345	47,794

Table 10.1 Switching Data
SBC -- Southwestern Bell Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gross Capital Expenditures (Millions)	$1,519	$1,835	$1,723	$1,739	$1,759	$2,326	$2,741	$2,752	$2,602
Local Switches	1,356	1,392	1,437	1,511	1,644	1,670	1,690	1,644	1,658
Tandems	48	67	64	60	60	60	60	67	56
Hosts	131	191	230	233	245	241	267	230	228
Remotes (Stand Alone Only)	311	488	672	779	935	1,077	1,077	1,158	1,163
Total Switches	1,380	1,425	1,469	1,539	1,679	1,730	1,750	1,711	1,727
Electromechanical	398	222	83	73	58	0	0	0	0
Analog Stored Program Control	366	348	308	264	252	162	136	115	88
Digital Stored Program Control	616	855	1,078	1,202	1,369	1,568	1,614	1,596	1,639
Total Number Access Lines in Service (000)	12,357	12,693	13,180	13,611	14,095	14,104	15,306	15,872	16,287
Electromechanical Lines Served	686	314	102	96	62	0	0	0	0
Analog Stored Program Control Lines Served	7,704	7,455	7,078	6,608	6,531	5,657	5,055	4,119	3,107
Digital Stored Program Control Lines Served	3,967	4,924	6,000	6,907	7,502	8,447	10,251	11,753	13,180
Touch-Tone Capable Switches	1,356	1,392	1,437	1,511	1,644	1,670	1,690	1,644	1,658
Access Lines with Touch-Tone Capability (000)	12,357	12,693	13,180	13,611	14,095	14,104	15,306	15,872	16,287
Switches Equipped for Equal Access	871	1,119	1,340	1,511	1,644	1,670	1,741	1,711	1,710
Access Lines with Equal Access (000)	11,517	12,284	13,060	13,611	14,095	14,104	15,306	15,872	16,287
Total Switches Equipped w/SS7-394 (InterLATA) Svc.	0	607	723	1,263	1,466	1,597	1,724	1,707	1,724
Lines with SS7-394 (InterLATA) Service (000)	0	8,117	8,828	12,787	13,289	13,890	15,249	15,858	16,276
Total Switches Equipped w/SS7-317 (IntraLATA) Svc.	105	563	649	1,263	1,466	1,597	1,724	1,707	1,724
Lines with SS7-317 (IntraLATA) Service (000)	2,332	7,733	8,468	12,787	13,289	13,890	15,249	15,858	16,276
Total Switches Equipped with ISDN	79	92	92	123	303	331	331	360	428
Lines with Access to ISDN (000)	981	1,964	1,476	1,933	8,826	9,440	10,577	13,361	12,158
Basic Rate ISDN (BRI) Interfaces Equipped	47,230	88,960	88,960	57,041	108,784	104,604	185,018	225,427	267,190
Primary Rate ISDN (PRI) Interfaces Equipped	161	380	410	1,238	5,084	6,150	15,434	31,570	46,533